

# NASA TECH BRIEF

## Langley Research Center



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### Portable Low-Frequency Vibration Measuring and Recording System

#### The problem:

To design an inexpensive, lightweight, portable, completely self-contained system for measuring and recording the vibrations which affect personnel comfort in space, air, and surface vehicles.

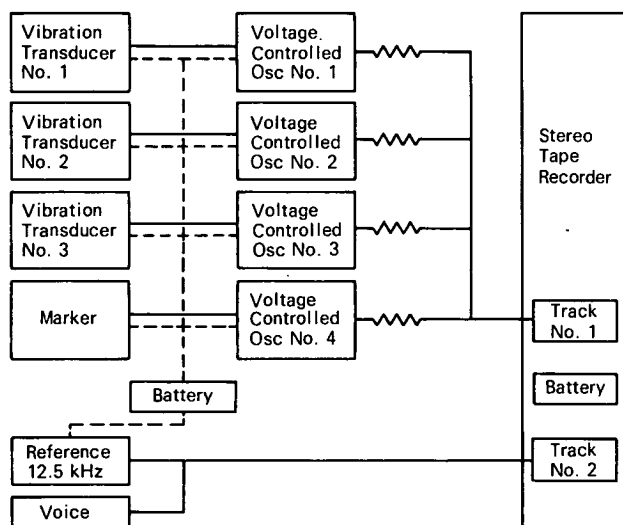


Figure 1. Measuring and Recording System

#### The solution:

A vibration information gathering system (Figure 1) consisting of a measuring system and a tape recorder. In the measuring system, three vibration transducers with mutually perpendicular axes control the frequency output of voltage controlled oscillators (VCO). The outputs of the VCO's are multiplexed and then recorded on one track of a stereo tape recorder. Data recovery (Figure 2) is accomplished by playback through discriminators.

#### How it's done:

Low frequency (0 to 30 Hz) vibrations associated

with passenger vehicles are measured by three vibration transducers (28 V servo-accelerometers sensitive to 0 Hz) with mutually perpendicular orientation. The electrical outputs of the vibration transducers control the frequencies of narrow band inter-record gap (IRG) VCO's with center frequencies of 7,350, 10,500, and 14,500 Hz. Ten additional data chan-

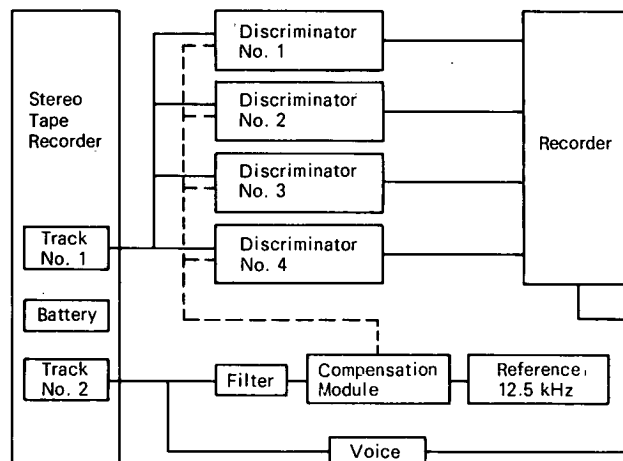


Figure 2. Data Recovery System

nels can be obtained by adding 10 VCO's with center frequencies below 7,350 Hz. One VCO with a center frequency of 2,300 Hz (which could have been as low as 400 Hz) is included for the insertion of reference markers in the data. The outputs of the 4 VCO's are resistively coupled to multiplex the signals, which are then recorded on one track of a stereo tape recorder. A reference signal of 12,500 Hz and a voice annotation are recorded on the second track.

The base of the measuring system container was made so that sharp pointed legs of specified

(continued overleaf)

dimensions can be attached in order to eliminate undesired signals generated by instrument rocking on soft or uneven surfaces. Also, component distribution was planned in order to achieve a low center of gravity, eliminating tipping of the instrument.

In data recovery, the playback of the multiplexed data through discriminators produces an output voltage directly proportional to the amplitude of acceleration.

Wow and flutter of the tape recorder are minimized to less than 2% during playback by a compensation module which detects deviation of the reference frequency and applies a correction to the other discriminators.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
Langley Research Center  
Hampton, Virginia 23365  
Reference: TSP71-10126

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel  
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